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YIELD TO MATURITY BOND: INTEREST RATE, INFLATION AND BOND RATING – EMPIRICAL RESEARCH ON BANKING SECTOR

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Abstract
This research aims at determining the impact of interest rates, inflation and bond rating on bond yields to maturity. This type of exploration using quantitative exploration with an associative approach. purposive sampling was used for the selection of research samples. The population of this research is banking companies listed on the Indonesia Stock Exchange in 2016-2020. This disquisition used panel data regression analysis system. From the model test, a random effect model was attained as a model estimator. The result of this research is that interest rates, inflation, and bond rating together affect bond yields to maturity. Interest rate and inflation variables did not affect a bond's yield to maturity. The bond standing variable harms the bond's yield to maturity.

INTRODUCTION

Based on information on the Bank Indonesia website, demand for Indonesian bonds continued to experience positive movements from 2016 to 2020. In 2020 there was the largest increase of 16.8 with the aggregate of issuers and bond issuers scoring the highest quantum value compared to the previous time. This proved that at a time when global austerity was slowing, investment is one of the main factors of profitable growth. (Kolokolova, et al. 2020) Bond demand (especially for commercial bonds) is less liquid than equity demand. Given the large trading volumes associated with barricade finance in this demand and the importance of fixed income demand for other investments (eg, pension finance), research into the impact on bond prices is of paramount importance.

According to Bisnis.com, the rate of return for Indonesian bonds is projected to fall to the level of 6.5 per cent and 6.8 per cent by the end of 2020 if Bank Indonesia again lowers its benchmark interest rate. Meanwhile, Bank Indonesia's benchmark interest rate is currently at the level of 4.00%. BI still has enough room to cut interest rates again by 25 per cent to a level of 3.75 per cent because Indonesia's inflation rate also continues to be at a low level.

Even with the current interest rate position, interest yields should be able to fall but what is happening in the market is not volatile because of the level of risk. The crisis that hit the financial markets this year is different from the previous ones because it currently involved the Covid-19 pandemic, whose development is difficult to predict. As a result, there is an increase in the level of risk in the financial market, including

bonds, so that the compensation coupon remained at a high level and yields are reluctant to fall. The Covid-19 epidemic is an extremity of global health that requires restrictive measures aimed at containing the spread of the Corona Virus with its devastating impact on the world. So frugality has beneficial consequences and requires rapid and expansive policy measures (Caporale, et al. 2022). However, in 2020 when the outbreak occurred, investors refrained from investing in bonds because the risk overshadowed investors. With the impact of an epidemic like this, banking companies work hard to better present their good image by further improving the company's performance, managing and developing company cash in creating company value to compete with other companies.

Banking companies as the sector under research because the banking sector is the heart of the country's economy. The source of bank finance is to collect funds from the wider community. Financial resources are also used for business development through credit or credit loans. According to Hasanah, et al. (2022), investors expected banks to be serious about contributing to sustainable development management. All investment policies carried out by banks are expected to encourage the SDGs, not the other way around. Because of the importance of the role of banking in a country, the banking sector is so tempting for investors. Investors assume that the actuality of banking will last a long time and always develop from time to time so that the rate of return would be high compared to other sectors.

As an investment instrument, changes in bond yields attained by investors would change from time to time. Changes in yield affected the asking price of the bond itself. Thus, investors and issuers must always pay attention to bond prices and the factors that affected changes in bond yields. The factors that affected the yield to maturity are internal factors, bond characteristics, and external factors. Macro factors including leverage, interest rates, and gross domestic product can affect bond yields to maturity. The characteristics of bonds that are considered by investors are bond ratings and bond ages. While the internal factors influenced the company's fiscal performance. There are several reasons why investors preferred bonds over stocks. One of them is that the rate of return on bonds is generally fixed so that it would minimize the threat of loss. Another reason is that the issuer was cancelled, and bond investors have the honour to prioritize other creditors (Fitriadi & Marsoem, 2022). Bond investors would earn returns at a rate called yield. Yields would vary over time as interest rates changed and affected the bond's asking price. The return would come from the difference in the asking price of the bond when it's traded. Yield to maturity (YTM) is the total return that investors would get from the date of purchase and hold to maturity.

Research conducted by Yanto & Darmansyah (2021) concluded that the SBI interest rate did not affect yield to maturity. This is because overall interest rates were at normal levels which would greatly reduce bond trading. In contrast, the research conducted by Nurfauziah & Setyarini (2004) stated that the SBI interest rate harms yield to maturity. Research carried out by Nurfauziah & Setyarini (2004) showed a positive relationship between inflation and bond yields. Investments in securities similar to bonds are considered unsafe because their overall price rises as inflation increased further. As a result, investors anticipate a sustainable return on investment. This is in line with research by Surya & Nasher (2011) determined that inflation has a huge positive impact on bond yields. Research from Surya & Nasher (2011) show that bond ratings harm yields to maturity. In other words, the better the bond rating, the lower the yield to maturity. On the other hand, Nurfauziah & Setyarini (2004) argue that bond ratings did not affect yields to maturity. In addition to bonds, stocks are one of the investments that attract investors' attention. Putra & Sugiyanto (2021) examined macroeconomic factors, namely inflation and interest rates on stock prices, where the results of the analysis showed that inflation and interest rates had no effect on stock prices. This condition showed because the analysis focuses on one industrial sector that has different characteristics.

Given some conflicting research findings from previous researchers and related phenomena with bond yields to maturity, this research purpose is to further explore the impact of interest rates, inflation, and bond ratings on bond yields to maturity. The research aims at analyzing the effect of interest rates, inflation and bond ratings on bond yield to maturity. This research is based on the signalling theory. There are two types of signals, namely bad signals and good signals. Bad news signals provided information in the form of poor or declining performance, while good news provided information in the form of good or increasing company performance (Harr, et al. 2010). Signal theory proposed ways in which companies can provide signals to users of their financial statements. Signalling is in the form of information about financial statements. The company can also be used as a signal to respond to the market by the company. If the company felt its prospects are in good condition, the company's income and cash flow are increased or obtained at a level where bond yields can be paid, then the company will reduce bond yields. The market would respond negatively to the announcement so investors tended to choose other investments. The opposite would happen, if the company felt that the prospects are declining, the company will increase the payment of bond yields. The market will respond positively to the announcement. So that the outstanding bonds will sell quickly in the capital market.

Theoretically, this research aims at complementing the empirical evidence on the impact of interest rates, inflation, and bond ratings on yields to maturity. The benefit of this research is to assist and direct investors in the selection of investments that create future profits. For companies, it is to generate input in making decisions regarding the company's performance, especially those related to factors that would affect the yield to maturity of bonds.

METHOD

By employing quantitative research with an associative approach, wherever the research analyzed relationships between variables and analyzes mistreatment applied statistical tools. The info assortment techniques used literature research and documentation. Knowledge area unit is taken from monetary statements of Indonesian Stock Exchange-listed banking corporations for the amount of 2016-2020, cited from www.idx.co.id. The research population used banking corporations listed on the Indonesian Stock Exchange 2016-2020. The sampling methodology for this research used purposive sampling with the subsequent criteria:

Table 1. Population and Sample

Description	Amount
Banking corporations listed on the IDX for the amount 2016-2020.	38
Banking companies that did not issue outstanding bonds from 20-2020.	-7
Banking companies that report financial statements not denominated in rupiah.	-1
Bond-rated banking companies' investment grade is not registered at PT Pefindo for the period 2016-2020	-5
Banking corporations accepted (i)	25
Periods of observation (t)	5
Final Observations (i*t)	125

The dependent variable for this research is Yield to Maturity (YTM). Bonds contained two terms that describe the yield characteristics of bond yields and bond interest rates. Bond yields are one of the economic benefits investors got from bonds, and they tended to vary. Bond yields fluctuated because bond yields are so closely tied to the yield demanded by investors. Bonds reaching completely different maturities might have different bond yields. This is often the result of high bond yields associated with bond issue dates. A bond's yield to maturity is the compound interest rate an investor would receive if he bought the bond at its present value at maturity, to match the rate that would be expected if the bond were to be called to maturity. Yield to maturity will be calculated by the formula (Siregar & Suci Pratiwi, 2020):

$$YTM = Ci + \frac{\frac{Pp - P}{n}}{\frac{Pp + P}{2}}$$

Based on the above formula, YTM explained the yield to maturity bond, Ci is the coupon or bond interest, Pp indicated the par value of the bond, P is the bond price at t = 0, and n indicated remaining due time.

Table 2. Measurement of Independent Variables

Variable	Definition	Measurement Formula	Source
Interest Rate (X1)	Interest rate is the price of borrowing or the worth of procured borrowed funds, sometimes expressed as an annual rate. One of the macro factors that determine bond yields is the Bank Indonesia interest rate.	IR = BI Rate	(Listiawati & Paramita, 2018)
Inflation (X2)	Inflation in general can be interpreted as an increase in general prices continuously within a certain period	Inflation = ((IHKn – IHKo) : IHKo) x 100%	(Listiawati & Paramita, 2018)
Bond Rating (X3)	A bond's rating consists of a letter symbol assigned by a rating agency (the rating agency PT PEFINDO in Indonesia)	idAAA = 5, idAA+ = 4, idAA = 3, idAA- = 2, idA+ = 1, idA = 5, idA- = 4, idBBB+ = 3, idBBB = 2, idBBB- = 1	(Hasibuan et al., 2020)

The independent variables in this research are interest rates (X_1), inflation (X_2), and bond valuations (X_3). Table 2 showed the independent variable measurements used in this research. There are Chow tests (comparing common and fixed effects), Haussmann tests (comparing fixed and random effects), and Lagrange multipliers tests (comparing common and random effects) to see which estimation method is appropriate effects must be used. Data analysis techniques were performed by descriptive statistical analysis, which describes the variance of data. Then the classical assumption test consisted of Normality, Heteroscedasticity, Autocorrelation, and Multicollinearity. In this research, the Random Effect Model was obtained which was more appropriate to be used to test the hypothesis with the following equation:

$$Y_{it} = 10.968_{it} + 0.013X_{1it} + 1.226X_{2it} - 0.448X_{3it} + \varepsilon_{it}$$

A constant of 10,968 meant that if the independent variables are interest rates, inflation and bond ratings = 0, then the dependent variable yield to bond maturity is 10,96816. X_1 stands for Interest Rate, X_2 represented Inflation, X_3 stood for Bond Rating, i is the symbol for cross-section data, t stood for time series data, and ε stands for error. The regression coefficient for the interest rate variable is 0.013. This meant that if the interest rate increased by 1 and the other variables are fixed, the yield of the dependent variable increased by 0.013 until the bond matures. The regression coefficient of inflation is 1.226, this meant that if the variable inflation has increased by 1 and other variables are fixed, then the dependent variable yield to bond maturity would increase by 1.226409. The regression coefficient for the bond rating variable is -0.448, which meant if the bond rating variable increased by 1 and other variables are fixed, then the dependent variable yield to maturity bonds would decrease by 0.448.

RESULTS

By employing descriptive statistics data to identify the minimum, maximum, mean, and standard deviation for each variable index. The results of describing the research variable data are shown in the following table:

Table 4. Statistical Descriptive Analysis

Research variable	Mean	Med	Max	Min	Standard Deviation	N
YTM	9.683	9.49	12.59	4.10	1.635	125
IR	4.922	5.06	4.25	4.25	0.479	125
Inf	0.234	0.25	0.30	0.14	0.054	125
BR	3.648	4.00	5.00	1.00	1.272	125

Source: Secondary Data Processed, 2021

As presented in Table 4 showed descriptive statistics for the 125 dates. Bond yields to maturity, interest rates, inflation, and bond ratings all have mean values that are greater than standard deviations. This indicated that the research data are either clustered or homogeneous. The yield to maturity (Y) has a minimum value of 4.1, a maximum value of 12.59, an average value of 9.683, and a standard deviation of 1.635. The 9.683 average indicates a high level of income for investors to hold bonds to maturity.

Table 5. Model Estimation of Panel Data Regression Test

	Results	Conclusion of the right model
Chow Test (F cross-section)	0.0000	Fixed Effect Model (FEM).
Hausman Test (random cross-section)	0.1571	Random Effects Model (REM).
Langrage Test (breusch pagan both)	0.0000	Random Effects Model (REM).

Source: Secondary Data Processed, 2021

The Chow test result showed that the F cross-section probability value is 0.0000, which is below the 0.05 significance level, indicating that the fixed effects model is a good alternative between FEM and CEM. The Hausman test results show a cross-sectional random p-value of 0.1571, which is greater than the significance value of 0.05. Based on these data, we can conclude that the random effects model is a suitable research model for hypothesis testing. The Multiplier Lagrange test can compute both probabilities. 0.000 < 0.05, the random effects model (REM) is a good estimation model. From this, we can conclude that the regression model used to test the research hypothesis is a random effects model.

Table 6. Classical Assumption Test

	Normality Test (Jarque-Bera prob)	Heteroskedasticity Test (Prob. Independent variable regress with Residual Absolut)	Autocorrelation Test (Durbin Watson stat)	Multicollinearity test (correlation value between variables > 0.8)
Results	0.3550 > 0.05	0.7581 > 0.05 0.1821 > 0.05 0.5389 > 0.05	1.9184	No value > 0.8
Conclusion	Data is normally distributed	Free from heteroscedasticity problem	It is between -2 and 2. Free from autocorrelation problems.	There is no multicollinearity

Source: Secondary Data Processed, 2021

Classical acceptance test results showed that the data are normally distributed and free of heteroscedasticity, autocorrelation, and multicollinearity. This meant that the estimated model using the random effects model can be used as the basis for hypothesis testing.

Table 7. Random Effect Model - Test Results

Hypothesis	Coefficient	t-Statistics	Probability	Conclusion
IR, Ifl, BR (simultaneously) → YTM	10.96816	11.38677	0.0000	H1 Accepted
IR → YTM	0.013172	0.075379	0.9400	H2 Rejected
Ifl → YTM	1.226409	0.782815	0.4353	H3 Rejected
BR → YTM	-0.448742	-3.852372	0.0002	H4 Accepted

Source: Secondary Data Processed, 2021

The output of REM shows an R-square value of 0.0855 or 8.55%. This meant that the independent variable used in this research can influence the dependent variable by 8.55%, while 91.45% is influenced by other factors not examined in this research model.

F statistic test output for this research showed that the Prob value (F-statistic) is 0.000 less than 0.05. We could conclude that the first hypothesis was accepted. Interest rates, inflation, and bond-rating variables can simultaneously affect a bond's yield to maturity. These results concluded that the chosen model is good enough to predict the amount of income an investor would receive from holding a bond to maturity.

Based on the output of the t-test for the random effects model, we found that the probability value of the interest rate is 0.94 greater than 0.05. From this, we could conclude that the second hypothesis is rejected. This meant that interest rates did not affect the bond's yield to maturity. The probability value for inflation is 0.435 significance above 0.05. From this, we can conclude that the third hypothesis is rejected. This meant that inflation did not affect the bond's yield to maturity. Probability value for bond rating is 0.0002 < 0.05 with negative regression coefficient. We could conclude that the fourth hypothesis was accepted. This meant that a bond's rating harms yield to maturity bond.

DISCUSSION

First, this research finds interest rates, inflation and bond ratings simultaneously affect the yield to maturity bond. Information asymmetry can be avoided by providing sufficient information to the company. Providing information is done is to make disclosures. The more disclosures are made, the less information asymmetry in the company. Voluntary disclosures that can be made by companies are disclosure of bond ratings, as well as yields to bond maturity. Where this disclosure, is hoped that become a good signal between investors and company owners so that they do not there is a lack of information to all internal and external organs of the company. Voluntary disclosure of bond yields is expected to be means of conveying an advantage possessed by the company. The advantage of the company in question is superiority in terms of management finance, invested capital, and superiority in assets other form.

Second, the interest rate variable partially did not affect the yield to maturity of bonds. The results of this research are in line with the research conducted by Yanto & Darmansyah (2021) which showed that BI interest rates did not affect bond yields to maturity. Meanwhile, the high-interest rate set by BI would not affect the yield to maturity of the bonds.

While the results of this research are not in line with the analysis of Suryaningprang & Suteja (2019) and research by Mega & Widayat (2019) with the results of interest rates having a positive effect on yield to maturity. A constant positive direction indicated higher interest rates and higher bond yields for investors. Therefore, it

is ideal for investors to think about and monitor the development of SBI interest rates. This allowed investors to spot when interest rates are rising. This suggested that this is the easiest time to look for bonds and not the easiest time to catch capital gains. Investors can even pinpoint when interest rates have fallen. This suggested that it may be the perfect time to sell bonds or take capital gains. In addition, interest rates can also be used as a benchmark for investors to ascertain expected returns. This condition is very good when an investor is willing to speculate on a riskier instrument on the condition that it has a higher value, but investors are more likely to speculate on a safer instrument.

The results of this research are also very different from the results of the analysis of (Riani & Endri, 2022) with the results of the t-test showing that interest rates harm bond yield to maturity. The higher the future interest rate, the lower the expected bond yield which reduced the demand for these bonds. The decline in demand for bonds after interest rates rise and bond costs fall caused institutions to receive fewer funds, so the yields offered by companies are also lower.

An increase or decrease in interest rates has no impact on yield to maturity due to stronger factors such as an assessment of the amount of risk that occurs. In addition, investors tend to be oriented to the company's performance. This is the factor that causes the increase or decrease in the SBI interest rate and did not affect the yield to maturity of bonds.

Third, the inflation variable partially has no result on the yield to bond maturity. The results of this research area unit in line with the analysis that stated that the rate did not affect the yield to maturity price (Kusriyanto & Nelmida, 2019; Yuliah, et al. 2020).

The results of this research area unit completely different from the results of analysis by Paisarn (2012) wherever inflation as an economic science issue included a negative result on the yield unfold, this showed that a rise within the rate caused the yield to unfold to slim as a result of the rise in government yields is larger than the rise within the needed rate of coming from investment shackled. The results of this research are completely different from the analysis by Varirahartia & Santoso Marsoem (2022) using the t-test showing that inflation has a significant but negative outcome, this means that the higher the interest rate, the lower the yield to maturity. Inflation can have a significant impact on investment activity, especially bonds. High inflation can lead to higher costs, so constrained investments are riskier. As a result, investors can expect higher returns.

Different analysis results area unit shown by analysis from (Usman, et al. 2021; Pinho & Barradas, 2018), that the rate includes a vital positive result on bond certificate yields within the primary market. This suggested that rising inflation is creating greater uncertainty for investors. Especially for domestic investors, this raises return expectations to drive the increased returns demanded by investors. Since interest rates imply a positive outcome for bond yields in the primary market, a decrease in interest rates declared by the interest rate is often the driving force behind governments to lower yields in the primary market. Meanwhile, governments should prepare preliminary measures against rising rates.

The results of our research did not seem to be in line with previous analysis and become one among the various findings as a result of the unsteady rate can have a sway on investment in securities together with stocks and bonds. the rise in inflation can build investors reluctant to stay their funds shackled as a result they feel it's risky. once inflation would increase, costs rise so that trade players face uncertainty in running their businesses. Rising inflation caused investors to stay their funds in foreign investments as a result of their incline to be a lot of enticing and profitable.

Fourth, the bond rating variable harms bond yields to maturity. The results of this research are in line with the analysis conducted by (Simu, 2017; Weniasti & Marsoem, 2019; Siregar & Suci Pratiwi, 2020; Putri, Kartika, et al., 2019; Ramadhan, 2020) where bond ratings have a large negative impact on the number of bond certificate yields. The bond rating is one indicator of bond quality. The rating considered the potential future risk of certain bonds. High-rated bonds meant that they are relatively safe bonds and avoid the possibility of default. Bond ratings also replicate bond yields. Bond ratings harm yields to maturity. This analysis is following the idea that ratings and yields are inversely proportional so that if the bond rating is raised, the yield offered may decrease. Bonds with high ratings can offer a small risk of default so that their impact on bond yields is reduced.

Investors would speculate to invest their capital in the company. The higher the bond rating, the lower the probability of default. Low default risk can make bonds more attractive to investors and so the cost of bonds can increase. Bond costs that continued to increase can cause bond yields to decline due to the magnitude of the lower risk. Conversely, a lower-rated bond is a bond that has a higher risk, it must offer a higher return due to complete the achievable risk.

CONCLUSION

This suggested that rising inflation is creating greater uncertainty for investors. Especially for domestic investors, this has raised return expectations to drive the increased returns demanded by investors. Since interest rates implied a positive outcome for bond yields in the primary market, a decrease in interest rates declared by the interest rate is often the driving force behind governments to lower yields in the primary market. Meanwhile, governments should prepare preliminary measures against rising rates.

The high-interest rate set by BI would not affect the yield until the bond matures because there are alternative factors that affected the yield until maturity. Domestic investors tended to concentrate on yields. Based on the interest rate data used in this research, the change in the SBI interest rate between 2016 and 2020 is not too large. Things like that caused the increase or decrease in the SBI interest rate did not affect the amount of yield to maturity.

Inflation has little effect on bond yields to maturity because volatile rates can affect investments in securities such as stocks and bonds. Rising inflation can discourage investors from saving a lot of their funds because it is considered very risky. When inflation increased, costs got increased because business people faced uncertainty in running their businesses. Rising inflation caused investors to keep their funds in foreign investments because they tended to be lucrative and profitable.

Bond ratings harm the YTM of corporate bonds. The results showed that investors considered bond ratings when determining whether the size of a bond is suitable for investment, identifying the level of risk and determining the expected YTM amount increase.

The limitation of this research was that the coefficient of determination is still relatively small, this indicated that the independent variable in this research still has a small proportion in influencing the dependent variable. Companies that are analyzed are only in the banking sector so the research results cannot be used in general. It is hoped that further researchers would be able to develop approaches that considered surrogate variables with non-routine durations such as credit ratings and government status included in analytical models. Additionally, microeconomic and macroeconomic factors can also be combined into a single entity in the model, making the research model a more reliable model.

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